

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

UNDERGROUND OUTLET

(Ft.)
CODE 620

DEFINITION

A conduit installed beneath the surface of the ground to collect surface water and convey it to a suitable outlet.

PURPOSE

Dispose of excess water from terraces, diversions, subsurface drains, surface drains, trickle tubes or principal spillways from dams (outside the dam area only), or other concentrations without causing damage by erosion or flooding.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies where: (1) excess surface water needs to be disposed of; (2) a buried outlet is needed for Diversions (362), Terraces (600), Water and Sediment Control Basins (638) or similar practices; (3) an underground outlet can be installed that will safely dispose of excess water; and (4) surface outlets are impractical because of stability problems, climatic conditions, land use, or equipment traffic.

CRITERIA

Capacity. The underground outlet shall be designed, alone or in combination with other practices, with adequate capacity to insure that the terrace, diversion, or other practices function according to the standard for the specific practice. For example, an underground outlet can be used in combination with a grassed waterway or a surface drain to carry part of the design flow. The capacity of the underground outlet for natural or constructed basins shall be adequate for the intended purpose without causing excessive damage to crops, vegetation, or improvements.

Inlet. An inlet can be a collection box, a perforated riser, or other appropriate device. Its capacity shall be adequate to provide the maximum design flow in the conduit. Flow-control devices shall be installed as necessary. Perforated risers must be of durable material, structurally sound, and resistant to damage by rodents or other animals. If burning of vegetation is likely to create a fire hazard, the inlet shall be fire resistant. Blind inlets can be used where they are effective. Collection boxes must be large enough to facilitate maintenance and cleaning operations. The inlet must have an appropriate trash guard to insure that trash or other debris entering the inlet passes through the conduit without plugging. It must also have an animal guard to prevent the entry of rodents or other animals.

Pressure-relief wells shall be designed and installed as needed to control pressure. If junction boxes and other structures are needed, they shall be designed and installed in a manner that facilitates cleaning and other maintenance activities.

Hydraulics. Underground outlets shall be continuous conduits, tubing, or tile. Joints shall be hydraulically smooth, and the materials and methods used shall be recommended by the manufacturer. If a pressure system is used, joints shall be adequate to withstand the design pressure, including surges and vacuum. The maximum velocity must not exceed the safe velocity for the conduit materials and installation.

Lines shall be adequate to carry the design flow when the outlet and all inlets are operating at design capacity. Positive grade shall be maintained in all sections of an underground outlet. Capacity shall be based on the pipe size or on other flow control devices to prevent water from the upper inlets from discharging

<p>Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resource Conservation Service.</p>

through the lower inlets. The minimum conduit diameter shall be 3 inches.

Materials. Materials shall meet or exceed the design requirements against leakage and shall withstand internal pressure or vacuum and external loading. Plastic, concrete, aluminum, and steel shall meet the requirements specified in the applicable ASTM standard. All materials specified for Subsurface Drains (606) can be used for underground outlets. Conduits, however, can be perforated or nonperforated, depending on the design requirements. A filter fabric wrap (sock) or equivalent shall be used if migration of soil particles around conduit is anticipated. All exposed plastic materials shall be protected from degradation due to exposure to sunlight.

Outlet. The outlet shall be sufficiently stable for all anticipated flow conditions. It shall be designed for the maximum anticipated water surface at design flow. A continuous section of closed conduit or a headwall can be used at the outlet. If a closed conduit is used, it shall be durable and strong enough to withstand all anticipated loads, including those caused by ice. Outlets shall not be placed in areas of active erosion. If fire is a hazard, the outlet shall be fire resistant. All outlets must have animal guards to prevent the entry of rodents or other animals. Animal guards must be hinged to allow passage of debris.

Protection. All disturbed areas shall be reshaped and regraded so that they blend with the surrounding land features and conditions. Visual resources must be given the same consideration as other design features. Areas that are not to be farmed or covered by structural works shall be established to vegetation or otherwise protected from erosion as soon as practicable after construction.

CONSIDERATIONS

Consider effects on the water budget, especially on volumes and rates of runoff, infiltration, evaporation, transpiration, deep percolation, and ground water recharge.

Consider effects on the volume of downstream flow that might cause undesirable environmental, social, or economic effects.

Evaluate potential use for water management.

Consider effects on erosion and the movement of sediment, pathogens, and soluble and sediment-attached substances that would be carried by runoff.

Consider effects on the visual quality of downstream water resources.

Consider the construction-related effects on the quality of downstream watercourses.

Consider effects on wetlands or water-related wildlife habitats.

Evaluate potential impact on water quality due to agri-chemicals in outflow.

Consider depth of underground outlet in regard to tillage equipment depth and maintenance, if applicable.

PLANS AND SPECIFICATIONS

Plans and specifications for installing underground outlets shall be in keeping with this standard and shall describe the requirements for installing the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

Underground outlets shall be maintained by:

- Keeping inlets, trash guards, and collection boxes and structures clean and free of materials that can reduce the flow
- Repairing leaks and broken or crushed lines to insure proper functioning of the conduit
- Checking outlet conduit and animal guards to ensure proper functioning of the conduit
- Keeping adequate backfill over the conduit
- Repairing any eroded areas at the pipe outlet

CONSTRUCTION SPECIFICATION

Plans and specifications for installations of underground outlets shall be in keeping with this standard and shall describe the requirements for installation of this practice to achieve its intended purpose.

- A. **Scope.** This work shall consist of furnishing and installing conduits, inlets and other appurtenances as required for

underground outlets as shown on the drawings and specified herein.

B. Inspection and Handling of Materials.

Conduit and inlet materials shall be carefully inspected before installation. Where applicable, clay and concrete tile shall be checked for damage from freezing and thawing prior to installation. Bituminized fiber and plastic pipe and tubing shall be protected from hazards causing deformation or warping. Materials with physical imperfections or UV light damage shall not be installed.

Trench Excavation

Trench excavation shall be sufficient to provide required cover after other construction is completed. The cover over all conduit lines except metal pipe shall be 24 inches or more. The cover over metal pipe shall be 12 inches or more.

The trench bottom shall be smooth and free of exposed rock. If rock is encountered in the trench bottom, over-excavate the trench and place at least 2 inches of compacted earth or sand bedding in the trench to bring it up to the conduit grade. The bottom of the trench shall be grooved in the center for proper conduit bedding.

Maximum trench width shall be the conduit diameter plus 24 inches measured at the flow line. Minimum trench width shall be the conduit diameter plus 6 inches except when the trench is shaped to fit the conduit, additional width is not required.

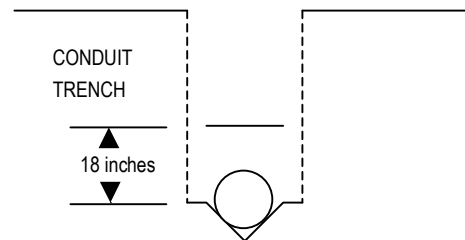
- C. Placement.** All underground outlets shall be laid to line and grade and covered with approved blinding, envelope or filter material to a depth of not less than 3 inches over the top of the drain. No reversals in grade of the conduit shall be permitted. Material used in blinding shall contain no rocks greater than 1-1/2 inches in diameter.

All conduits shall be installed in accordance with ASTM F449 "Standard Recommended Practice for Subsurface Installation of Corrugated Thermoplastic Tubing for Agricultural Drainage or Water Table Control."

Rigid conduits such as clay or concrete tile will not require the 90-degree V groove, but all other applicable placement and bedding requirements will be adhered to. Joints between drain tiles shall have the closest possible fit.

- D. Backfill.** Earth backfill material shall be placed in the trench in such a manner that displacement of the conduit will not occur and so that filter and bedding materials, after backfilling, will meet the requirement of the drawings and specification. Backfill within 2 feet of the conduit shall have no rock particles larger than 2 inches in diameter.

When conduits are installed two or more seasons prior to construction of terrace or diversion ridges, backfilling operations should be at an angle to the trench so that loose backfill material flows down the advancing frontslope. In all other cases, the conduit under the ridge area shall receive special backfilling as shown below:



Backfill shall have adequate moisture for compaction. Backfill within 6 inches of conduit shall be hand compacted. Subsequently, layers of backfill shall be placed in 6-inch lifts and mechanically compacted.

The moisture content can generally be considered as satisfactory if the fill material can be molded into a round ball between the hands without readily separating or squeezing out free water.

Water packing may be used as an alternative to mechanical compaction. If the conduit is non-perforated, it shall be filled with water during the water packing procedure. The initial backfill, before wetting, shall be of sufficient depth to ensure complete coverage of the pipe after consolidation has taken place. Water

packing is accomplished by adding water in such quantity as to thoroughly saturate the initial backfill without inundation. The wetted fill shall be allowed to dry until firm before final backfill is begun.

- E. **Inlets for Underground Outlets.** Inlets for underground outlets shall be installed in accordance with IL-ENG-118, or approved equivalent.

F. Materials

Materials for underground outlets shall meet the requirements as shown in the plans and specifications. They shall be field inspected for any deficiencies such as thin spots or cracking prior to installation.

Conduit

The following reference specifications pertain to products currently acceptable for use as underground outlets:

Plastic

Corrugated polyethylene (PE) tubing and fittings 3-6 in..... ASTM F-405

Large diameter corrugated polyethylene (PE) tubing and fittings 8-24" ASTM F-667

Corrugated polyvinyl chloride (PVC) tubing and compatible fittings 4-12 in ASTM F-800

Polyvinyl chloride (PVC) corrugated sewer pipe with a smooth interior and fittings 4-36 in..... ASTM F-949

Polyvinyl chloride (PVC) sewer pipe and fittings..... ASTM D-2729

Type PSM polyvinyl chloride (PVC) sewer pipe and fittings ASTM D-3034

Clay

Clay drain tile ASTM C-4

Perforated clay drain tile ..ASTM C- 498

Vitrified clay pipe, extra strength, standard strength, and perforated ASTM C-700

Vitrified clay pipe, test methods ASTM C-301

Concrete

Concrete drain tile 4-36 in .ASTM C-412

Concrete pipe for irrigation or drainage ASTM C-118

Concrete pipe, manhole sections, or tile, test methodsASTM C-497

Concrete sewer, storm drain, and culvert pipe ASTM C-14

Reinforced concrete culvert, storm drain, and sewer pipeASTM C-76

Perforated concrete pipe .. ASTM C-444

Portland cementASTM C-150

Other

Styrene-rubber (SR) plastic drain pipe and fittingASTM D-2852

Corrugated aluminum pipe for sewers and drains ASTM B-745

Corrugated steel pipe, metallic-coated for sewers and drains..... ASTM A-760

Outlet

A continuous section of non-perforated conduit at least 16 feet long shall be used at the outlet. Acceptable materials for use at the outlet include the following:

1. Corrugated metal pipe, galvanized or aluminum, 16 gauge,
2. Smooth steel pipe with 3/16 of an inch minimum thickness,
3. Smooth plastic pipe, polyvinyl chloride (PVC), with a SDR of 26 or less or schedule 40 or heavier,

4. Dual wall corrugated polyethylene pipe.

All plastic and polyethylene pipe outlets shall include an ultra-violet stabilizer. Conduit ends shall be protected during installation.

FINISH

Work areas shall be smoothed and left in a workmanlike manner. Vegetation or other protective cover shall be established as specified.

OPERATION AND MAINTENANCE REQUIREMENTS

1. Remove trash and debris from the pipe inlet.
2. Maintain the minimum earth cover over the pipe.
3. Repair all broken or crushed lines to ensure proper functioning of the conduit.
4. Repair or replace damaged inlets or structures.
5. Repair any eroded areas at the pipe outlet.
6. Check outlet conduit and rodent guards to insure proper functioning of the outlet.
7. Remove trash build-up on the orifice. Make sure the orifice is properly re-seated after it has been cleaned.
8. Re-distribute sediment build-up so the inlet is in the lowest place.

SPECIAL SPECIFICATIONS
